Mandatory Practical – Conduct water quality tests on a water sample T036

Name:

Date:

Activity: Complete the table below using the appropriate equipment and following kit instructions

Location	Date & Time	Group Members

Temp. °C	pH 0-14	DO mg/L	DO % sat	Conductivity mS/cm	Salinity ‰ or ppt	Total N µg/L	Total P µg/L	Clarity m.
Multi-meter probe or thermometer	Multi-meter probe or litmus paper	Multi-meter probe or mini-titration kit	Multi-meter probe or formula (below)	Multi-meter probe	Multi-meter probe or Table 1 (PTO)	Test kits	Test kits	Secchi Disc Depth

DO (mg/L → %sat)

To convert DO mg/L to DO% sat:

DO% sat. = $\frac{\text{DO mg/L x 100}}{\text{DO at saturation}}$

E.g. If the DO was recorded at **6.8** mg/L & the temperature was 25°C (see shaded row)….

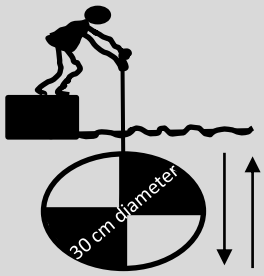
6.8 x 100 / 8.4 = 80.95% sat.

Note: Temperature changes DO. E.g. water at 25°C is 100% saturated with DO at 8.4 mg/L.

Temp. °C	DO at saturation
21	9.0
22	8.8
23	8.7
24	8.5
25	**8.4**
26	8.2
27	8.1
28	7.9
29	7.8
See next page for full table	

How to use a Secchi Disc

Lower the secchi disc into the water, looking straight down at it. Record the depth that it disappears. Lift the disc back up again.
Record the depth it reappears.
Average the two depths (add them together and divide by 2).
This is your **water clarity.**



Down	Up
m.	m.
Average:	m.

Hint: do a few practice runs first

***Note*: turbidity (NTU) is another measure of water clarity**

Activity: Download *Water Quality Parameters (pdf)* and *HBEEC Mud Crab and Water Quality Data Excel spreadsheet (xlsx)* from www.marineeducation.com.au (Home - scroll down to *Free Downloads*). Compare your values to those provided.

Interpreting the results

Activity: Describe what your results indicate about the overall health of the ecosystem

CONVERSION TABLES

FOR REFERENCE PURPOSES ONLY

Name:

Date:

Table 1: For converting Conductivity to Salinity

Conductivity mS/cm				Salinity (dissolved salt)
15°C	20°C	25°C	30°C	‰ or ppt *(parts per thousand)*
25.9	29.0	32.2	35.5	20
27.1	30.3	33.6	37.0	21
28.3	31.6	35.0	38.6	22
29.4	32.9	36.5	40.1	23
30.6	34.2	37.9	41.7	24
31.7	35.4	39.3	43.2	25
32.8	36.7	40.7	44.8	26
33.9	37.9	42.1	46.3	27
35.1	39.2	43.5	47.8	28
36.2	40.4	44.8	49.4	29
37.2	41.7	46.2	50.9	30
38.5	43.0	47.6	52.4	31
39.6	44.2	49.0	53.9	32
40.7	45.4	50.3	55.4	33
41.8	46.7	51.7	56.8	34
42.9	47.9	53.0	58.3	35
44.0	49.1	54.4	59.8	36

Table 2: for converting DO mg/L to DO %sat

Temp. °C	DO at saturation (mg/L)
11	11.1
12	10.8
13	10.6
14	10.4
15	10.2
16	10.0
17	9.7
18	9.5
19	9.4
20	9.2
21	9.0
22	8.8
23	8.7
24	8.5
25	8.4
26	8.2
27	8.1
28	7.9
29	7.8
30	7.6

Note: Freshwater Is usually measured in µS/cm whereas Saltwater is usually measured in mS/cm

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Water Quality Parameters

Name:

Date:

Adapted from: Cairns Regional Council
https://www.cairns.qld.gov.au/water-waste-roads/water/smartcatchments/live-data-saltwater-creek2

Temperature

Temperature controls the rate of fundamental biochemical processes in organisms. Organisms that can only live within a narrow temperature range are called **stenothermal.** Whereas, organisms that can live within a wide temperature range are called **eurythermal.** Water temperature is affected by air temperature, stormwater runoff, groundwater inflow, turbidity and exposure to sunlight.
A rise in temperature reduces the concentration of dissolved oxygen (DO) in the water.
Likewise, a drop in temperature increases the concentration of dissolved oxygen (DO) in the water.
A **thermocline** is when there is an abrupt change in temperature with depth, forming a barrier between the warm water (usually above the thermocline) and the cold water (usually below the thermocline).

pH

pH is used to measure the acidity or alkalinity of a solution. Changing levels of pH in a creek or river can be an indicator of increasing pollution or some other environmental factor. A pH value is a number from 1-14, with 7 as the middle (neutral) point. The optimum pH levels for fish is between 6.5 and 8.4

Dissolved Oxygen (DO)

Aquatic animals rely on oxygen that is dissolved in the water to survive. Levels of Dissolved Oxygen (DO) vary depending on factors including water temperature, **time of day,** season, depth, altitude, rate of flow, and levels of pollution. If DO levels drop too low, there is not enough oxygen for the animals to 'breathe' and it can lead to 'fish kill events' where large numbers of fish die within a short period.
DO is measured in milligram per litre (mg/L) or parts per million (ppm). Exposure to less than 2 mg/L oxygen for one to four days may kill most of the biota in a system, leaving behind only the low-DO-tolerant fish, air-breathing insects and anaerobic (not requiring oxygen) bacteria and fungi (microflora). Lethal DO concentrations for fish are generally between 1 and 3 mg/L. DO can also be measured as % saturation, whereby DO should be somewhere between 80-105%. DO <61% or >108% is poor quality.

Salinity

Salinity is a measure of salt content. Salinity is usually measured in parts per thousand (ppt). The salinity of *fresh*-water in rivers and creeks averages 0.5ppt or less. The salinity of *sea*-water averages 35ppt. The mixture of seawater and freshwater in estuaries is called **brackish** water and its salinity can range from 0.5ppt to 35ppt. Organisms that can only live within a narrow salinity range are called **stenohaline.** Whereas, organisms that can live within a wide salinity range are called **euryhaline.**

Turbidity (NTU)

Estuary Indicator Scores
Good/Very Good: ≤10
Moderate: 11-13
Poor: 14-16
Very Poor: >16

Turbidity is the cloudiness or haziness of the water caused by suspended solids. Turbidity does not identify individual substances; it just indicates that something is there.

Water Quality Parameters

Name:

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Depth and Flow

The overall size, depth and flow of a waterway can affect its water quality. For example, contaminants entering deep and fast-moving rivers will have less effect on the river than the same amount of contaminants entering a slow moving, shallow creek. The depth of the creek can also affect other 'parameters' of water quality, such as temperature and light which both decrease with depth. Measuring flow and concentration allows us to observe any change in the load of contaminants and sediment that may be in the water. Load = concentration x flow. Whereby, flow is a measurement of the amount of water (volume) x the speed of the water (velocity). Depth and flow are influenced by tides, weather, the landscape and obstructions such as rocks, fallen trees and bends in the waterway.

Nutrients – Nitrogen and Phosphorus

Nitrogen and phosphorus naturally enter estuarine waters when freshwater runoff passes over geologic formations rich in phosphate or nitrate, or when decomposing organic matter and wildlife waste get flushed into rivers and streams. Man-made sources of nutrients entering estuaries include sewage treatment plants, leaky septic tanks, industrial wastewater, acid rain, and fertilizer runoff from agricultural, residential, and urban areas. Too much nitrogen and phosphorus acts as a water pollutant. This leads to explosive algae blooms that cloud the water and deplete the oxygen.
Dissolved Inorganic Nitrogen (also known as Total Oxidised Nitrogen) is often measured in mg/L.
Dissolved Inorganic Phosphorus (also known as FRP or Ortho Phosphate) is often measured in mg/L.

Dissolved Inorganic Nitrogen (mg/L)
Estuary Indicator Score
Good/Very Good: ≤0.045
Moderate: 0.046-0.095
Poor: 0.096-0.146
Very Poor: >0.146

Dissolved Inorganic Phosphorus (mg/L)
Estuary Indicator Score
Good/Very good: ≤0.005
Moderate: 0.0051-0.0066
Poor: 0.0067-0.0082
Very Poor: >0.0082

Chlorophyll a (µg/L)
Estuary Indicator Score
Good/Very Good: ≤3
Moderate: 3.1-3.6
Poor: 3.7- 4.3
Very Poor: >4.3

Chlorophyll a concentrations are used as an indicator of algae abundance and productivity in aquatic environments. Higher concentrations typically indicate poor water quality, usually when high algal production is maintained due to high nutrient concentrations.

Bacterial Enterococci (CFU: colony forming units)

Enterococci bacteria are found in the faeces of human and warm-blooded animals. The presence of enterococci in water is an indicator of faecal pollution and possible enteric pathogens. The median bacterial content in samples of fresh or marine waters taken over the bathing season should not exceed 35 enterococci CFU/100 mL.